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ABSTRACT:

CHG DATE=19990617 STATUS=O> An engine starting mechanism comprises a spring actuated starter motor the spring of which can be stressed by manually rotating a shaft, the starter being released by manually releasing a latch. Releasing the latch causes rotation of a pinion to crank the engine. The latch means is coupled by a first "Bowden" cable to a release lever at a

position remote from  
the starter and the shaft is rotated by means of a ratchet  
mechanism coupled to  
an actuating lever by a second "Bowden" cable.

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Abstract Text - FPAR (1):

CHG DATE=19990617 STATUS=O> An engine starting mechanism  
comprises a spring  
actuated starter motor the spring of which can be stressed  
by manually rotating  
a shaft, the starter being released by manually releasing a  
latch. Releasing  
the latch causes rotation of a pinion to crank the engine.  
The latch means is  
coupled by a first "Bowden" cable to a release lever at a  
position remote from  
the starter and the shaft is rotated by means of a ratchet  
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an actuating lever by a second "Bowden" cable.

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(72) Inventors <b>Devinder Vir Rai Sangram Sen-Gupta</b>	(58) Field of search <b>F1K</b>
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**(54) Engine starting mechanism**

(57) An engine starting mechanism comprises a spring actuated starter motor the spring of which can be stressed by manually rotating a shaft, the starter being released by manually releasing a latch. Releasing the latch causes rotation of a pinion to crank the engine. The latch means is coupled by a first "Bowden" cable to a release lever at a position remote from the starter and the shaft is rotated by means of a ratchet mechanism coupled to an actuating lever by a second "Bowden" cable.

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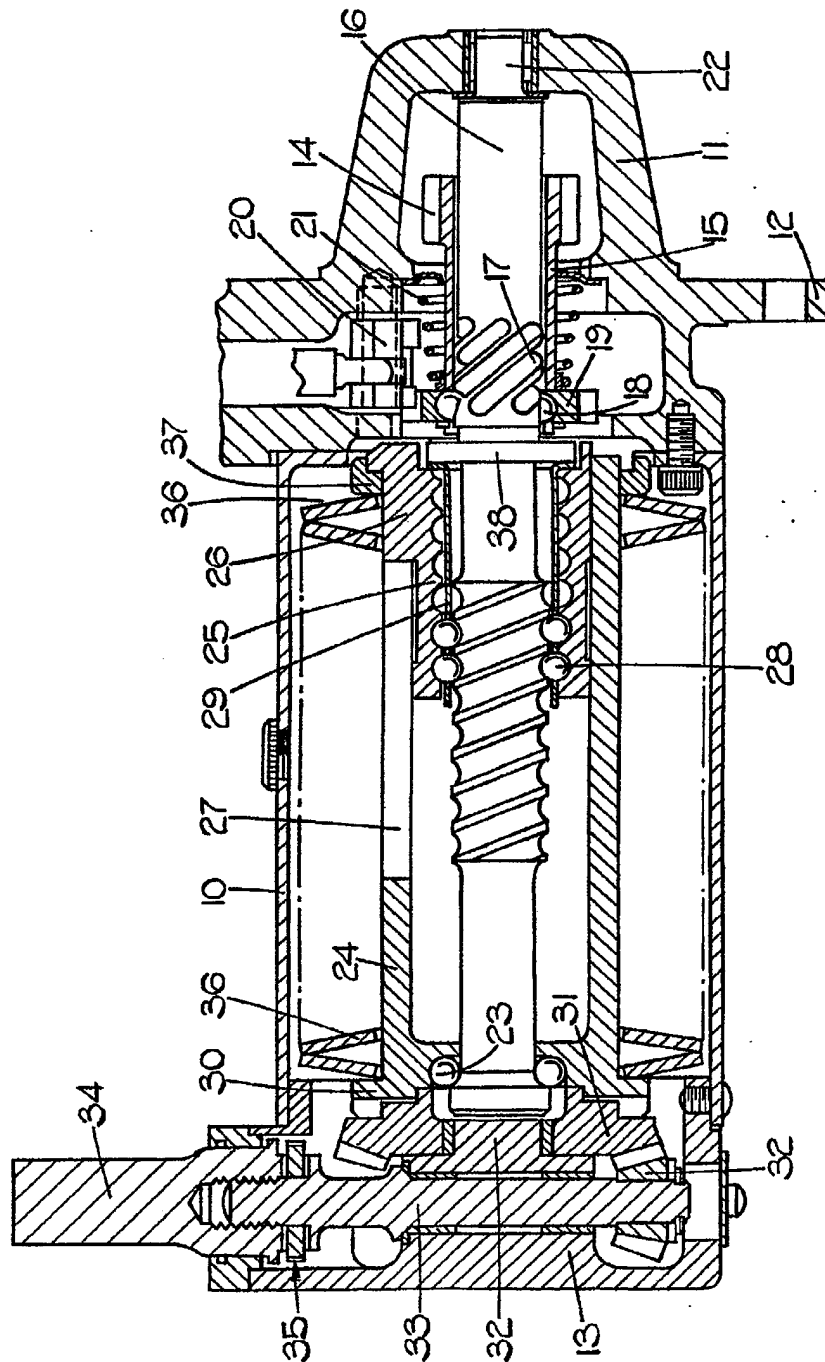


FIG.1.

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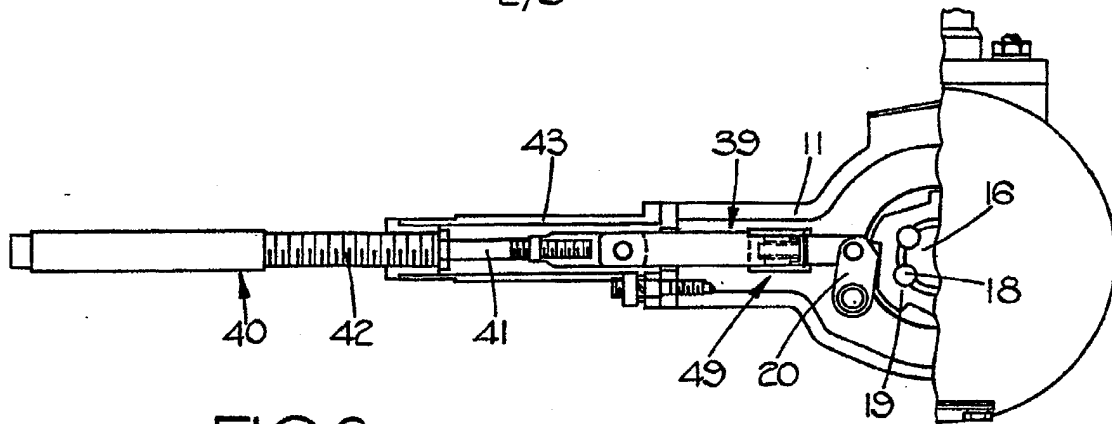


FIG. 2.

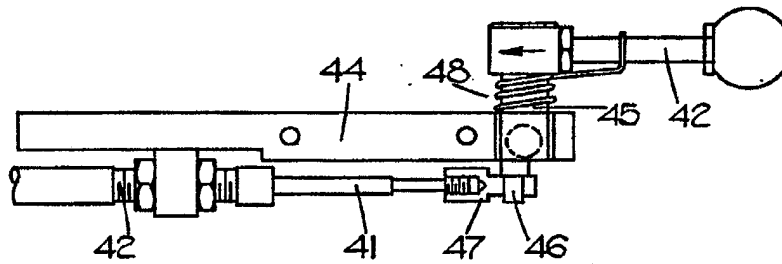


FIG. 3.

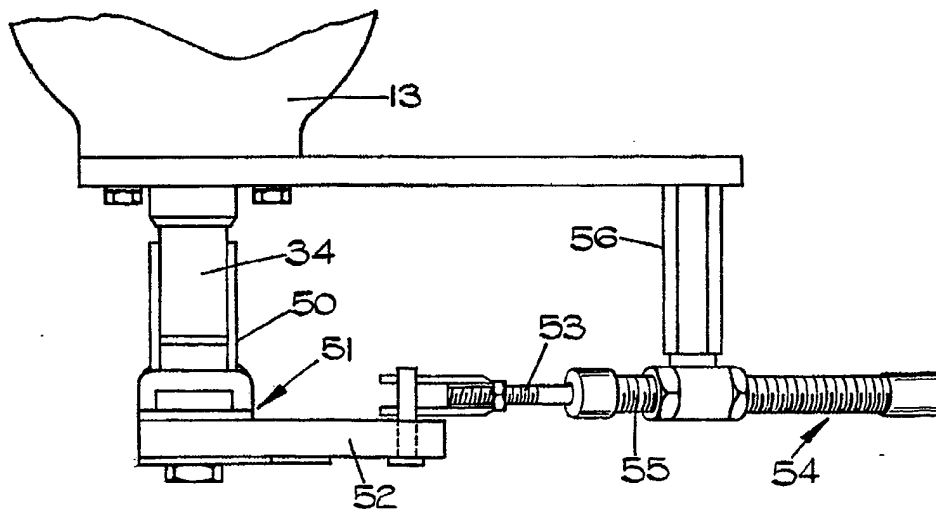


FIG. 4.

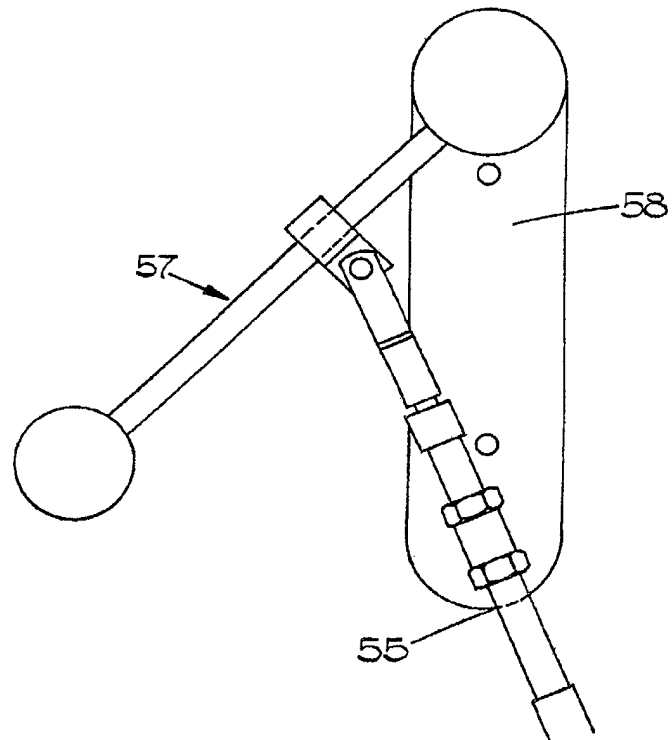


FIG. 5.

## SPECIFICATION

**Engine starting mechanism**

5 This invention relates to a starting mechanism for an internal combustion engine, the mechanism being of the kind comprising an axially movable pinion mounted about a shaft supported in a housing, a helical thread connection between the shaft and the pinion, resilient means located in the housing, means connecting the resilient means with said shaft whereby when said resilient means has been stressed a driving torque will be applied to said shaft, releasable latch means for restraining angular movement of the shaft and manually operable means for tensioning said resilient means, the arrangement being such that when said resilient means has been stressed release of the latch means will permit rotation of the shaft and said pinion.

20 An example of such a starting mechanism is shown in the specification of British patent 1107521. The advantage of such a starting mechanism is that it requires no electrical power and therefore if the mechanism is used in association with an compression ignition engine, no electrical power is required for operating the engine. In the starting mechanism described in the aforesaid specification the latch means is released by means of a handle carried on the housing of the mechanism and the stressing means includes a rotary drive shaft which projects from the housing and is engageable by a handle which can be rotated to stress the spring means. The starting mechanism was designed for starting stationary engines or tractor engines where there was no problem in gaining access to the mechanism. Modern engine installations often include covers placed around the engine to minimise noise and also to improve the appearance. However, some users while acknowledging the advantages of the starting mechanism demand that the mechanism should be operable from a remote point such for example as the cab of a tractor.

The object of the invention is to provide a mechanism of the kind specified in a simple and convenient form.

According to the invention in a starting mechanism of the kind specified said latch means includes a pivotal latch member for engagement with teeth on a ratchet wheel, link means connecting said latch member with the flexible inner member of a first "Bowden" cable the outer member of said cable being secured to the housing of the mechanism, said inner member being connected to a release lever situated at a remote position and carried by a mounting to which the outer member is also connected, said manually operable means including a rotary shaft extending to the exterior of the housing, a lever coupled to said shaft through a ratchet mechanism, a second "Bowden" cable extending to said remote position and

60 having its inner member coupled to said lever and its outer member connected to said housing, said inner member at said remote position being coupled to an actuating lever mounted upon a support to which the outer member of the cable is connected.

65 An example of a starting mechanism in accordance with the invention will now be described with reference to the accompanying drawings in which:—

Figure 1 is a sectional side elevation of the mechanism,

70 Figure 2 is a view through part of the mechanism shown in Figure 1,

Figure 3 is a plan view showing the release mechanism,

Figure 4 is a view of an attachment to the mechanism of Figure 1, and

75 Figure 5 shows the energising mechanism.

Referring to Figure 1 of the drawings the starter mechanism comprises a generally cylindrical casing 10 to one end of which is secured a mounting 11 having a flange 12 whereby the mechanism can be mounted on the structure of an associated engine. At the other end of the casing is an end closure 13.

The mechanism includes a pinion 14 for engagement with the teeth of the fly wheel of the associated engine, the pinion being carried by a sleeve 15 which is movable in helical fashion, about a shaft 16. The shaft carries helical thread formations 17 with which are engaged balls 18 which are located within recesses in the sleeve 15 and which are confined by a ratchet wheel 19. A coiled compression spring 21 engages with the ratchet wheel to urge the pinion and sleeve towards the position shown in the drawings. A pivotal latch member 20 is provided for engagement with the teeth of the ratchet wheel as will be described.

95 The shaft 16 is supported in a bearing 22 in the mounting 11 and its other end is shaped to define a track for a ball race 23 the other track of which is located in the end wall of a cup-shaped member 24 which is co-axial with the shaft and which extends to adjacent the mounting 11.

100 Slidable within the cup-shaped member is a ball nut housing 25 which has at least one driving lug 26 extending outwardly therefrom. The lug or lugs 26 are located in a slot or slots 27 formed in the wall of the cup-shaped member 24.

105 The ball nut housing defines on its internal peripheral surface, helical ball tracks, complementary tracks being formed on the shaft 16. The tracks are occupied by a plurality of balls 28 conveniently located by means of a cage member 29.

110 The cup-shaped member 24 is provided at its end adjacent the bearing 23, with a peripheral flange 30 and this is coupled by driving dogs, to a bevel gear 31 mounted about a spigot bearing 32 defined by the end closure 13. The bevel gear is provided with teeth and these are engaged by a pinion 32 carried upon a shaft 33 rotatably mounted in the end closure and coupled to a shaft 34 of non-circular section extending to the

The drawing(s) originally filed was (were) informal and the print here reproduced is taken from a later filed formal copy.

The claims were filed later than the filing date within the period prescribed by Rule 25(1) of the Patents Rules 1982.

exterior of the mechanism. A ratchet mechanism generally indicated at 35 is provided on the shaft 33 and the purpose of this will be described.

Surrounding the exterior of the cup-shaped member 24 is a plurality of dished springs 36. The springs are disposed in pairs with their concave faces presented to each other and the stack of springs thus formed engages the flange 30 at one end and an annular member 37 which engages with projecting portions of the lugs 26 on the ball nut housing 25.

As shown in the drawings, the resilient means in the form of the springs 36, is in a relaxed state it being noted that the ball nut housing is abutting against a flange 38 on the shaft 16. When the operator of the engine requires to start the engine he or she first makes sure that the latch member 20 is in engagement with the teeth of the ratchet wheel 19 and having ascertained that this is so, rotates the shaft 34, the initial rotation of the cup-shaped member 24 also effects rotation of the shaft 16 by way of the ball nut. The sleeve 15 is restrained against angular movement by the latch 20 and as a result axial movement is imparted to the sleeve 15 and the pinion to move the latter into engagement with the toothed wheel of the engine. When full axial movement of the sleeve against the action of the spring 21 has taken place a portion of the latch 20 engages with the teeth of the ratchet wheel 19 to prevent further rotation of the sleeve and pinion and hence also the shaft. The latch is so constructed that if for example, tooth to tooth engagement of the pinion and toothed wheel takes place, the sleeve and pinion can move angularly to free such engagement, the pinion then completing its axial movement.

When the shaft 16 can no longer rotate the ball nut housing 25 due to the action of the helical tracks, moves axially as well as rotating. The effect of such axial movement is to compress the springs 36 and the lugs move along the slots 27. When the springs are fully compressed which can be ascertained by inspection through suitable window, rotation of the shaft 34 ceases and the ratchet mechanism 35 locks to prevent rotation of the shaft 33. When the latch is released the shaft 16 rotates the pinion which in turn rotates the engine. As soon as the engine fires and starts to accelerate, the pinion will be thrown out of engagement with the toothed wheel and will be returned and held in the position in which it is shown, by means of the spring 21.

Turning now to Figure 2, the latch member 20 is connected by means of a linkage 39 to the inner member 41 of a "Bowden" cable 40. The outer member of the cable is secured to a housing 43 which is in turn secured to the casting 11. The cable 40 extends to a remote position at which and as shown in Figure 3, the inner member is connected to an operating lever 43, the latter being pivotally mounted in a mounting 44 to which the outer member 42 of the cable is adjustably connected. Conveniently the lever 42 is carried on a rotary shaft 45 having an eccentrically disposed pin 46 about which is located a terminal piece 47 connected to the inner member 41 of the cable. Moreover, the lever 42 is biased by a torsion spring 48 the force exerted by which must be overcome when it is required to release the latch.

Conveniently the aforesaid linkage 39 incorporates a lost motion connection 49 which ensures that the lever 42 must be moved from the latched position, before the latch 20 itself is moved.

Turning now to Figure 4, the shaft 34 which as stated is of non-circular shape, is surrounded by a socket member 50 having a complementary internal shape and this is coupled through a ratchet mechanism 51, to a lever 52. The lever 52 is coupled to the inner member 53 of a "Bowden" cable 54 the outer member 55 of which is adjustably secured to a support 56 carried by the end closure 13. The cable 54 extends to a remote position and the inner member is coupled to an angularly movable lever 57 as shown in Figure 5. The lever 57 is carried on a support 58 to which the outer member 55 of the cable is adjustably connected. By moving the lever 57 angularly backwards and forwards the shaft 34 is intermittently rotated to compress the springs 36. Once the springs are fully compressed and in this case this is determined by allowing the driving lugs 26 to engage the end walls of the slots 27, the lever 42 is then operated to release the latch member to obtain starting of the associated engine.

#### CLAIMS

1. A starting mechanism for an internal combustion engine, the mechanism being of the kind comprising an axially movable pinion mounted about a shaft supported in a housing, a helical thread connection between the shaft and the pinion, resilient means located in the housing, means connecting the resilient means with said shaft whereby when said resilient means has been stressed a driving torque will be applied to said shaft, releasable latch means for restraining angular movement of the shaft and manually operable means for tensioning said resilient means, the arrangement being such that when said resilient means has been stressed release of the latch means will permit rotation of the shaft and said pinion, said latch means including a pivotal latch member for engagement with teeth on a ratchet wheel, link means connecting said latch member with the flexible inner member of a first "Bowden" cable the outer member of said cable being secured to the housing of the mechanism, said inner member being connected to a release lever situated at a remote position and carried by a mounting to which the outer member is also connected, said manually operable means including a rotary shaft extending to the exterior of the housing, a lever coupled to said shaft through a ratchet mechanism, a second "Bowden" cable extending to said remote position and having its inner member coupled to said lever and its outer member connected to said housing, said inner member at said remote position being coupled to an actuating lever mounted upon a support to which the outer member of the cable is connected.

2. A starting mechanism according to Claim 1 including a spring acting to bias said release lever to an inoperative position in which said releasable latch means restrains angular movement of the shaft.

3. A starting mechanism according to Claim 2 in which said link means forms a lost motion connection between the inner member of the first cable and said latch means.



4. A starting mechanism for an internal combustion engine comprising the combination and arrangement of parts substantially as herein described with reference to the accompanying drawing.

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